



M1A1 Cannon Cradle Repair at Anniston Army Depot



Presented by

Tony Pollard
Anniston Army Depot (ANAD)

Phillip F. Leyman
Army Research Laboratory (ARL)

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE JUL 2004		2. REPORT TYPE		3. DATES COVERED 00-00-2004 to 00-00-2004	
4. TITLE AND SUBTITLE M1A1 Cannon Cradle Repair at Anniston Army Depot				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Anniston Army Depot,7 Frankford Ave,Anniston,AL,36260				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES 24th Replacement of Hard Chrome Plating Program Review Meeting, July 20-21, 2004, Park City, UT. Sponsored by SERDP/ESTCP.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 10	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			



The Problem

- M1A1 Abrams Tank Gun Cradle Corrosion
- No Ability to Repair Large Pits
- Cradles in ~ 10% of Tanks Overhauled are Salvage due to corrosion



The Program

- Large corrosion pits 1/8" by 3/8" – 0.060" deep
- Build up pits with base material
- Base material - 4130 steel
- Repair material – Inconel 718



The Payoff

- Reclamation of Serviceable Gun Cradles
- Cost of New Cradle = \$25K
- Cost of Repair = \$700 per Cradle
- Cost Saving of \$360K per year at Anniston (15 Cradles)



Procedure

- Clean cradle using vapor degreaser.
- Using hand-held grinder w/wire brush, remove corrosion from pit.
- Using hand-held grinder w/grinding tool, break the sharp edges of the pit.
- Using the ESD Equipment fill the pit to .005" - .010" above the parent material surface.
- Using ID grinder, grind ID to prepare for chroming.
- Chrome plate and finish grind.



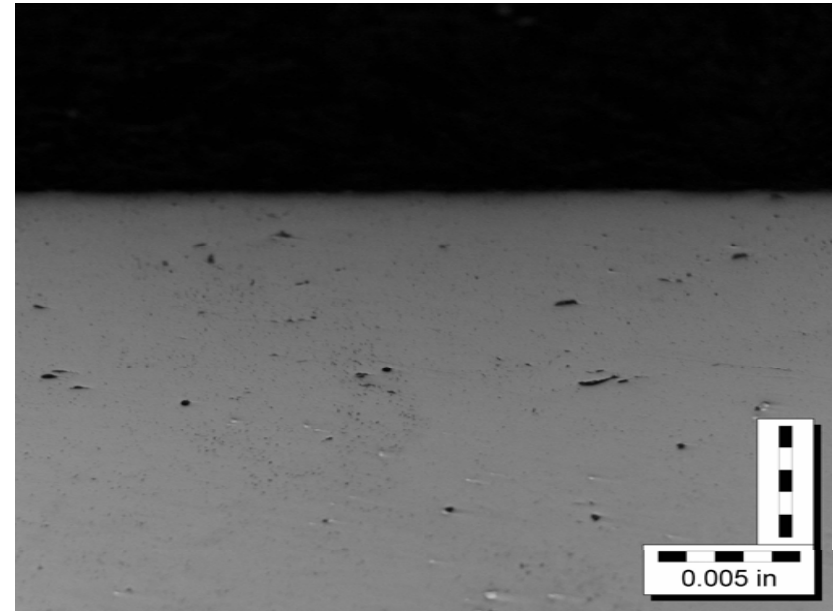
Initial Repair Process ESD Settings

- Pulse Rate – 580 Hz
- Capacitance – 20 mfd
- Voltage – 100 volts
- Step Rate – 270 Hz
- Swing – 3
- Rotate Increment – 3
- Direction – CW
- Interval – 6



Development of Improved Process ESD Settings

- Pulse Rate – 400 Hz
- Capacitance – 30 mfd
- Voltage – 150 volts
- Step Rate – 340 Hz
- Swing – 3
- Rotate Increment – 3
- Direction – CW
- Interval – 6
- Argon Gas Atmosphere



Micrograph of ESD applied Iconel 718
(.010" dimple)

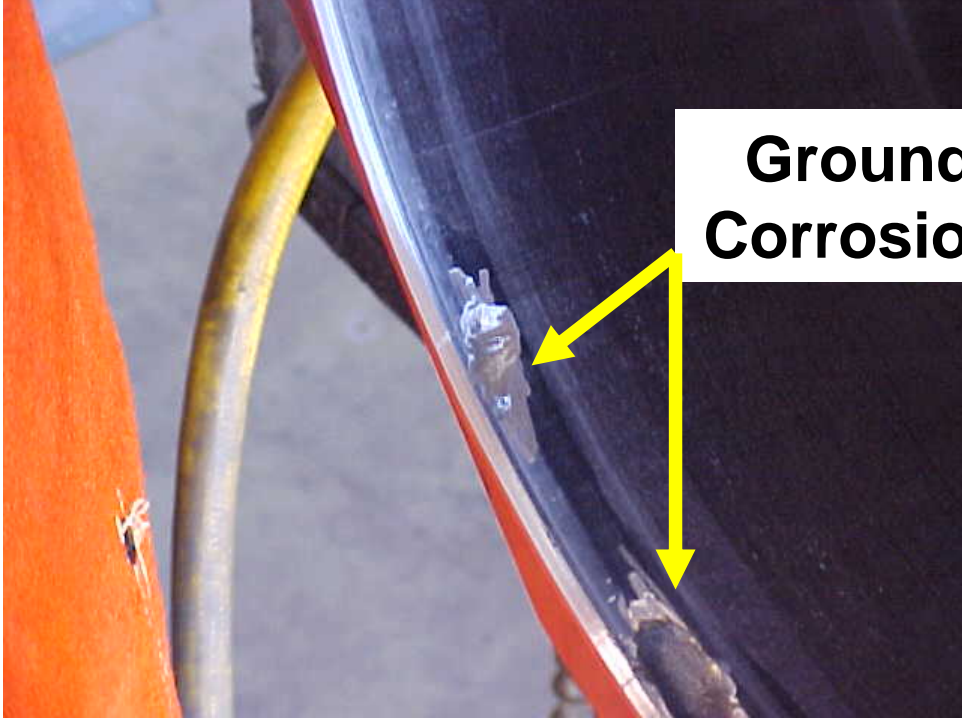


Inspection

Characteristic	Method of Inspection	Requisite
Serviceability	Visually (10X Microscope)	No blistering, peeling, cracking allowed.
Dimensional	Measure	IAW DMWR 9-2350-264-2
Surface Finish	Measure	IAW DMWR 9-2350-264-2



M1A1 Cannon Cradle Repair



**Ground Out
Corrosion Pits**



**Build up
in
Progress**



**Repaired Area
After Plating**



Future Projects

- Investigate additional candidates for ESD Repair Process
 - M88/M60 Roadwheel Arm Spindle
 - M198 Recoil Rod